

REMARKS

Applicant respectfully requests reconsideration of this application as amended.

Status of Claims

With this Response, claim 21 is amended. No claims are added. No claims are cancelled. Therefore, claims 1-16, 18-19 and 21-24 are pending.

CLAIM REJECTIONS - 35 U.S.C. § 103

Claims 1, 2, 8, 11, 12 and 22 were rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent Application Publication No. 2002/0025408 issued to Davis (hereinafter "Davis").

Claims 3-6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Davis in view of U.S. Patent No. 5,956,216 issued to Chou (hereinafter "Chou'216").

Claim 10 and 13-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Davis.

Claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Davis in view of Chou-216 further in view of U.S. Patent No. 6,309,580 issued to Chou (hereinafter "Chou'580")

Claims 9 and 21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Davis in view of Faircloth (J. Vac. Sci. Technol. B, Vol. 18, No. 4 Jul/Aug 2000).

Claims 18 and 19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Davis in view of Faircloth further in view of Chou'216.

Claims 23 and 24 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Davis in view of Chou'216, Chou'580 and U.S. Patent No. 4,786,564 issued to Chen (hereinafter "Chen").

Claim 1

Claim 1 has been rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent Application Publication No. 2002/0025408 issued to Davis (hereinafter "Davis"). It is submitted that claim 1 is patentable over the cited reference.

Claim 1 recites a method, in part:

"separating the stamper from the resist film **before the resist film is cooled below approximately a glass transition temperature** of the resist film"
(emphasis added)

The Office Action asserts claim 1 is obvious either because 1) the claimed subject matter is an optimization of Davis or 2) the claimed subject matter is a rearrangement of process steps disclosed by the reference.

1. Claim 1 is Not an Optimization of Davis

A. The Time in the Process for which Davis States the Substrate May Be “maintained, increased or decreased” is Ambiguous.

Applicant maintains the position that the Office Action is inappropriately reading a timeline into the statements of Davis. Davis merely states, “after placing the substrate in the mold the temperature thereof can be maintained, increased or decreased as necessary in order to optimize replication and enable substrate release from the mold while maintaining the integrity of the surface features.” (paragraph [0075]).

Applicant continues to understand such maintenance, increases or decreases only generally refer to a time “**after** placing the substrate in the mold” and **cannot** be further assumed to also pertain to the much more specific time of **when the substrate is actually removed** from the mold. Applicant submits it is just as likely as the interpretation provided by the Office Action, for the statement to mean the temperature is to be maintained *until* substrate is to be removed. Applicant again notes that the only statements where Davis is specific to the temperature of the substrate **relative to the time of removal from the mold** are statements describing the temperature of the substrate to be **below the glass transition temperature prior to removal** from the mold.

Thus, while the Office Action has defended the position that “other methods are not foreclosed” by the sentences specifically reciting cooling the substrate to below the glass transition temperature prior to removal of the mold (OA, p. 12), Applicant emphasizes there are no other sentences in Davis to the contrary which unambiguously refer to the temperature **at the time of substrate removal** from the mold.

B. The Difference Between the Claimed Subject Matter and Davis is not a Result-effective Variable.

The Office Action asserts, “Davis teaches that the particular temperatures of both the mold and resist represent result-effective variables that should be optimized in order to (1)

optimize replication, (2) enable substrate release from the mold, and (3) maintain the integrity of the surface features. Thus, the temperatures of both mold and resist represent result effective variables that should be optimized.” (OA, p. 4)

Applicant reminds the Examiner that a “result-effective variable” is narrowly interpreted to be only that which “achieves a **recognized result**, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.” *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (emphasis added).

It is Applicant’s position that Davis is replete with statements that the resist is cooled below Tg **prior to** removing the resist from the mold to achieve such results (abstract, third sentence paragraph [0075], paragraph [0076], claim 1, claims 10-17, etc.). Applicant fails to find any disclosure in Davis to indicate doing the exact opposite (**not** cooling below Tg prior to removal) is simply another value of a result-effective variable. Applicant’s claim 1 is not a situation of merely claiming a narrower range than a reference discloses, but rather doing the opposite of that specifically disclosed (separating from the mold while resist is above Tg, not cooling before removing, etc.).

Applicant respectfully disagrees with Office Action’s characterization that Davis’ statement, “after placing the substrate in the mold the temperature thereof can be maintained...,” (para. [0075]) “suggests a result.” (OA, p.12) Instead, it is Applicant’s position this sentence merely generically lists out all physically possible alternatives of conditions at any time after placing the substrate in the mold: 1) maintained, 2) heated, and 3) cooled. Applicant notes there are no other options for a temperature of the substrate possible. Therefore, this statement by Davis is an absence of disclosure because it is tantamount to saying “anything can be done to the substrate temperature after being placed in the mold of any temperature... as necessary to enable substrate release from the mold.” Nowhere is the result of the substrate temperature at the particular time of removal ever provided as a recognized result **except where it is cooled below Tg prior to removal from the mold**. The maintenance, increases or decreases of temperature are distinct treatments, none of which are indicated by Davis to be done at any particular time to achieve any particular result. Thus, the sentence can amount to no more than “anything can be done, if needed” and Applicant submits such an uninformative, generic statement does not justify dismissing a claimed element as a “result-effective variable.”

C. Davis' Specific Statements Teaching Away from Claimed Subject Matter Illustrate Use of Improper Hindsight

Davis paragraph [0075], concretely states, "to maintain the integrity of the surface features, the molded substrate is cooled to below the glass transition temperature prior to removal from the mold." This is a statement one of ordinary skill in the art would certainly consider when evaluating the teachings of Davis, as evidence by an earlier filed declaration.

Furthermore, Davis paragraph [0076], states, "by preheating to, and **maintaining the mold at a temperature below the glass transition temperature** of the material, the time required... is significantly diminished." (emphasis added) Davis goes on to say, "the mold is heated to and maintained at a temperature **below the glass transition temperature...the mold then cools the substrate**. The substrate can **then be removed from the mold**" (emphasis added).

These paragraphs, as well as references to cooling the substrate below T_g, are replete throughout Davis (abstract, claim 1, claim 10, claims 11-17). Therefore, the Examiner's interpretation that Davis teaches a higher than T_g mold may be "maintained" **while the substrate is removed from the mold** is taught away from by every statement by Davis explicitly pertaining to the temperature of the resist **at time of separation from the mold**. Thus, it is Applicant's position that the Office Action is improperly relying on the knowledge of the Applicant's claimed method and not on teachings that one of ordinary skill in the art would derive from Davis.

2. Claim 1 is Not an Obvious Re-ordering of Prior Art Process Steps

The Office Action states that "there appears to be no dispute that steps of heating, imprinting, separating, and cooling are disclosed by the reference, and it is generally prima facie obvious to rearrange process steps in the absence of unexpected results"

A. Claim 1 recites a new way of separating a mold from the resist film

Davis paragraph [0073] states "to maintain the integrity of the surface features, the molded substrate is cooled to below the glass transition temperature prior to removal from the mold." Therefore, Applicant submits the difference from Davis of "separating the stamper from the resist film **before the resist film is cooled below approximately a glass transition temperature** of the resist film" is not merely a reordering of a step but rather a process step

conducted with a completely different set of conditions (removal at Tg or above) that are in fact contrary to those conditions Davis unambiguously teaches to be a functional and desirable conditions.

B. Evidence of Unexpected Result is Provided Herewith

The declaration submitted herewith under 37 C.F.R. §1.132 as secondary evidence of non-obviousness also rebuts the assertion made in the Office Action that claim re-cites “separating the stamper from the resist film **before the resist film is cooled below approximately a glass transition temperature** of the resist film” is a prima facie obvious reordering of process steps disclosed in Davis.

The declaration states, “it was a total surprise that there existed a temperature at which good embossing occurred without incurring reflow on opening the mold.” The declaration further describes the conditions of the prior art and those presently claimed where the mold is opened (e.g. separating the stamper from the resist film) at an embossing temperature above the glass transition temperature (e.g. before the resist film is cooled below approximately the glass transition temperature).

Claim 21

Claim 21 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Davis in view of Faircloth (J. Vac. Sci. Technol. B, Vol. 18, No. 4 Jul/Aug 2000). It is submitted that claim 21 is patentable over the cited references.

Claim 21 recites:

“heating a stamper and a resist film to a first temperature at least that of a transition temperature of the resist film, wherein the resist film comprises a plurality of resist layers;
imprinting the stamper into the resist film;
cooling the resist film to a second temperature above room temperature; and
separating the stamper from the resist film at the second temperature above room temperature.”

Applicant has amended claim 21 to clarify that the resist film comprising a plurality of layers is separated from the mold at the second temperature, above room temperature.

1) Incorporation of the Method of Faircloth Into That of Davis Would Render Davis Inoperable for its Intended Purpose

Davis teaches imprinting a polymer that becomes a permanent topological feature of the substrate, wherein postprocessing includes “vapor deposition of metals”(para. [0080]). Thus, Davis is directed at forming **continuous metal films over underlying topography of 10 to 150 nm.** (Davis para. [0072]-[0080]) In contrast, Faircloth is specifically limited to techniques “to provide undercutting that dramatically improves the metal liftoff.” (p. 1866, right col.) Thus, Faircloth is directed at forming **discontinuous metal films of which a portion is removed upon a removal of underlying topography.**

Faircloth states, “the final step in preparing the sample for metal deposition and liftoff is to descum the PMMA from the bottom of the trenches while **simultaneously creating undercut** in the bottom layer.” (p. 1868, right col.) Applicant submits, such a descum does not “enhance” the ability to descum the bottom of the trenches for Davis’ purposes, as described in the Office Action, because Faircloth teaches that the **descum also necessarily undercuts the lower layer** of the bi-layer resist. Therefore, if combined with Davis, the undercut bi-layer resist stack would cause Davis’ subsequently vapor deposited metals to be discontinuous at the undercut, forming voids. Because Davis’ metal coated polymer topography are permanent features of the substrate where voids would not be desirable, Applicant considers Faircloth’s bi-layer resist, which undercuts during the descum process to make subsequent metals discontinuous and voided, would be highly undesirable to Davis’ intended purpose of forming permanent, metal-coated structures. At a minimum, given the conflicting goals and results of the two references, Applicant fails to see how it could possibly be obvious to even try combining a bi-layer resist of Faircloth in Davis’ single layer method.

2. Applying the Technique of Faircloth to that of Davis Does Not Provide Predictable Results.

The Office Action in rejecting claim 21 further asserted that one of ordinary skill in the art would have found it obvious to apply the technique of Faircloth to that of Davis to provide the predictable results. However, Applicant notes none of the sweepingly generalized statements made in paragraphs [0073]-[0075] of Davis regarding how the temperature of the substrate is manipulated after contacting the mold were made with any consideration of a polymer having a

plurality of layers. Because, as the Office Action admitted on p. 9, the bi-layers of Faircloth have “distinct characteristics” or “compression characteristics,” Applicant submits that Davis’ statements directed at a single layer polymer provide no basis for predictability where there is a plurality of resist layers.

CONCLUSION

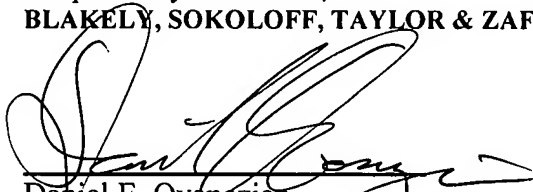
Applicant respectfully requests examination of the above-identified application in view of the response.

For at least the foregoing reasons, Applicant submits that the rejections of the claims have been overcome herein, placing all pending claims in condition for allowance. Such action is earnestly solicited. The Examiner is respectfully requested to contact the undersigned by telephone if such contact would further the examination of the above-identified application.

The Commissioner is authorized to charge or credit any deficiencies or overpayments in connection with this submission to Deposit Account No. 02-2666, and is requested to notify us of same.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN, LLP

Date: 2/7/08


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